REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1 and 6 are presently active in this case, Claims 1 and 6 having been amended by way of the present Amendment. Claims 2-5 and 7-18 have been canceled without prejudice or disclaimer.

In the outstanding Official Action, Claims 1-6 and 8-13 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that applicant regards as the invention. Regarding the rejection of Claim 1, the Applicants note that the formation of plasma has been clarified in Claim 1. Additionally, with regard to the one or more chemical vapor deposition reactions in a substrate tube, the Applicants that this is not a double inclusion, but rather an introduction of terms used in the claims. The word "a" has been removed after "one or more," and the phrase "doped or undoped" has been removed. The phrase "stoichiometric excess" as recited in Claim 1 is clear to one of ordinary skill in the art to include a stoichiometric amount of oxygen (i.e., a reactant) and an amount in excess thereof. Thus, the Applicants submit that this recitation is clear to one of ordinary skill in the art. The recitations of the "reaction" and the "deposition" have been clarified, as suggested. Additionally, step v) has been clarified and the recitations of Claims 2 and 3 have been incorporated into the language therein. The remaining rejected subject matter has been amended to clarify antecedent basis issues. Accordingly, the Applicants submit that the claim language is definite, and therefore respectfully request the withdrawal of the indefiniteness rejections.

Claims 1-6 and 8-13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Geittner et al. (PCVD at High Deposition Rates) in view of Davis (U.S. Patent No. 4,664,689) and optionally in view of Roba (U.S. Patent No. 4,608,070) . For the reasons discussed below, the Applicants request the withdrawal of the obviousness rejection.

The basic requirements for establishing a *prima facie* case of obviousness as set forth in MPEP 2143 include (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, (2) there must be a reasonable expectation of success, and (3) the reference (or references when combined) must teach or suggest all of the claim limitations. The Applicants submit that a *prima facie* case of obviousness has not been established in the present case because the references, either taken singularly or in combination, do not teach or suggest all of the claim limitations, and there is no suggestion or motivation to modify the references to arrive at the presently claimed invention.

Claim 1 of the present application recites a method of manufacturing an optical fibre using a plasma chemical vapour deposition (PCVD) process by carrying out one or more chemical vapour deposition reactions in a substrate tube. The method comprises the following steps: i) supplying one or more glass-forming precursors to the substrate tube, ii) supplying a stoichiometric excess of oxygen to the substrate tube, iii) setting up the one or more reactions in the substrate tube between reactants supplied in steps i) and ii) to form a plasma within the substrate tube so as to effect the deposition of one or more glass layers on an interior of the substrate tube, iv) subjecting the substrate tube thus coated in step iii) to a collapsing process so as to form a preform, and finally v) drawing said preform into an

optical fibre, wherein a Reynolds number is in accordance with the formula 120<Re<285 during the deposition process according to step iii), wherein the Reynolds number is calculated on the basis of the reactants supplied to the substrate tube in step i) and step ii), under a temperature of 1000-1150 °C and a pressure of 4-35 mbar in the interior of the substrate tube during step iii). A deposition rate of at least 2 g/min is used in step iii), and the stoichiometric excess of oxygen used during step ii) ranges from 1.8-5.0. The Applicants respectfully submit that the cited references, either taken singularly or in combination, do not disclose or suggest all of the limitations recited in Claim 1 of the present application. Thus, a *prima facie* case of obviousness cannot be established for Claim 1.

The essence of the present invention is the fact that the Applicants have observed that it is the Reynolds number that is the critical technical parameter for obtaining a high deposition efficiency of the PCVD process. The Reynolds number in this respect is calculated on the basis of the reactants supplied to a substrate tube under a certain temperature range and a certain pressure range inside the substrate tube.

The actual deposition during the PCVD process takes place in a relatively short area inside the substrate tube, in which area plasma is generated, usually by means of microwaves. Inside the plasma, relatively high temperatures are present and the plasma matter itself includes ions, radicals, electrons and atoms originating from the molecules as supplied to the plasma. It is presently difficult, if not even impossible, to accurately describe the plasma in terms of conventional process parameters like temperature, density, viscosity etc.

The present invention is, however, based on the insight that, despite the inability to precisely characterize the plasma (where the actual deposition takes place), the deposition efficiency of the PCVD process can be characterized by the Reynolds number, which is

calculated as stated above.

Without considering at this stage the actual claimed range of the Reynolds number, which corresponds to high deposition efficiency, the mere fact that the above mentioned relation exists cannot be regarded as obvious based on the cited art. The Reynolds number indeed is well known in the art for being a number characterizing the flow conditions inside, for example, a tube. The person of ordinary skill in the art will know that a Reynolds number higher than approximately 2500 corresponds to turbulent flow conditions, whereas a number lower than approximately 2500 corresponds to laminar flow conditions. Thus, the function of the Reynolds number is to characterize flow conditions inside a tube.

The cited art does not suggest any relationship between the Reynolds number and the deposition efficiency of the PCVD process. Thus, the cited art does not define the Reynolds number as a result effective variable with respect to deposition efficiency of a PCVD process.

Page 8 of the Office Action of March 16, 2006, indicates that "since Geittner teaches laminar flow, one would have been motivated to optimize the Reynolds number." Alternatively, the Office Action dated August 15, 2005, refers to page 819, column 2, 2nd paragraph, where it is disclosed that "the pressure drop along the substrate tube obeys the Hagen Poiseuille equation for laminar flow."

As already states above, the function of the Reynolds number is to characterize flow conditions. Since the Geittner et al. reference already discloses the fact that the flow in the PCVD process is laminar, there is no incentive for the person of ordinary skill in the art to calculate the Reynolds number to confirm this fact in another way. The Geittner et al. reference describes that there exists a relationship between the inner diameter of the substrate tube and the flow inside this tube corresponding to a certain deposition speed (see Fig. 2 of

the Geittner et al. reference). Although the person of ordinary skill in the art would never calculate the Reynolds number in the first place, if he for some reason would decide to do so, he would still not learn that the deposition efficiency of the PCVD process having a deposition speed higher than 2 g/min is related to the Reynolds number, as presented in the present application. This fact is supported by the calculations presented in response to the Office Action dated August 15, 2005. These calculations clearly show, that the examples presented in the present application fall outside the range as taught by the Geittner et al. reference. Thus, the person or ordinary skill in the art will directly find that the teachings of the Geittner et al. reference are invalid or incorrect for deposition rates higher than 2 g/min. Based on this there is no incentive for the person of ordinary skill in the art to even consider the teachings of the Geittner et al. reference.

The Davis reference fails to supplement the deficiencies noted above with respect to the Geittner et al. reference. The Davis reference relates to an optical fiber cooler wherein an optical fiber is passed through the axial length of an enclosure having means for passing cryogenic gas through its wall. The Davis reference does not relate to a method of manufacturing optical fiber by carrying out one ore more chemical vapour deposition reactions in a substrate tube. Therefore, the Davis reference does not provide any information about Reynolds numbers, let alone its importance thereof. Thus, the Geittner et al. reference and the Davis reference fail to establish a *prima facie* case of obviousness with respect to Claim 1.

Furthermore, with respect to the additional obviousness combination in view of the Roba reference, the Roba reference relates the Reynolds number to the deposition efficiency for an IVPO process. In such a process, glass particles are formed in the gas phase, which are

deposited on the internal surface of a supporting tube (substrate tube). Since there is no turbulence (the Reynolds number is lower than 500), the particles have a radial motion due to causes independent of the main flow. (See column 4, lines 47-65, of the Roba reference).

The person of ordinary skill in the art, confronted with the problem of characterizing the PCVD process having a high deposition efficiency, will not consult the Roba reference. First of all, as mentioned above, the Roba reference relates to the IVPO process, which is very different from the PCVD process of the present invention. Namely, in the PCVD process no particles are produced, let alone that particles migrate to the internal surface of the substrate tube. Instead, glass layers are deposited directly on the internal surface of the substrate tube. Such a way of making glass layers has no technical relationship with the method disclosed in the Roba reference.

A further difference between IVPO and PCVD is the pressure. The pressure during the PCVD process according to the invention is between 4 and 35 mbar, as is recited in amended Claim 1. The person of ordinary skill in the art knows that the IVPO process according to the Roba reference is performed at a pressure of approximately 1000 mbar (i.e. atmospheric pressure). This pressure can be calculated on the basis of the information disclosed in the Roba reference.

Yet another difference is the temperature. The IVPO process, according to the Roba reference, takes place at a temperature of at least 1400° C. The temperature of the process according to the present invention is between 1000 and 1150° C, as is recited in amended Claim 1.

Since migration of glass particles is not an issue for the PCVD process at all, the teachings of the Roba reference concerning the Reynolds number cannot be applied to the

PCVD process. The Official Action suggests that the Roba reference at least gives the person of ordinary skill in the art an incentive to try to apply the Reynolds number in the present invention. However, given the difference in nature of the IVPO process versus the PCVD, the person of ordinary skill in the art wanting to characterize the PCVD process, will never consult the Roba reference. For the same reason, a combination with the Geittner et al. reference is illogical and hence not obvious. Furthermore, the Applicants submit that the Official Action appears to be applying an improper "obvious to try" rationale, which is based on hindsight gleaned from the present invention, rather than from the teachings known to one of ordinary skill in the art at the time of the present invention. (See MPEP 2145 X.B.)

Thus, based on the Roba reference and the Geittner et al. reference, one of ordinary skill in the art would never realize that a relation exists between the Reynolds number and the deposition efficiency of the PCVD process. And, even assuming for the sake of argument that such a combination was made, the person of ordinary skill in the art would not arrive at the invention as claimed in amended Claim 1.

Furthermore, the Applicants would like to restate that the Geittner et al. reference only provides extrapolated process data rather than actual process data (see Fig. 2) on the PCVD processes having a deposition speed higher than 2g/min. Hence, the person of ordinary skill in the art has to rely on the accuracy and correctness of such extrapolation. Given the fact that the processes as described in the examples of the present application already throw doubt upon the applicability of the Geittner et al. reference, it is arguable that the extrapolation is inaccurate and therefore not desirable.

Finally, the claimed range of the Reynolds numbers is relatively small compared to the entire range in which a flow can be considered laminar ($0 < Re < 2500$). The Applicants

have made very clear why a Reynolds number smaller than 120 or higher than 285 is undesirable. The cited art does not teach, nor suggest that these limits exist, let alone that such a range is critical to achieve high deposition efficiency for PCVD processes.

The Applicants respectfully submit that the combination of the Geittner et al. reference, the Davis reference, and the Roba reference fail to establish a *prima facie case* of obviousness with respect to Claim 1 of the present application for the reasons set forth above. Accordingly, the Applicants respectfully request the withdrawal of the obviousness rejection of Claim 1.

The dependent claim is considered allowable for the reasons advanced for Claim 1 from which it depends. This claim is further considered allowable as it recites other features of the invention that are neither disclosed nor suggested by the applied references when those features are considered within the context of Claim 1.

Consequently, in view of the above discussion, it is respectfully submitted that the present application is in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully Submitted,

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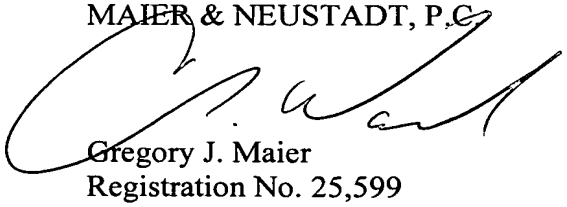

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